(*Pamphlet No. 45*)

TANGANYIKA TERRITORY

DEPARTMENT OF AGRICULTURE

Thirteenth Annual Report

of the

Coffee Research & Experimental Station, Lyamungu, Moshi

1946

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A difference between any two treatments greater than the figure given as "Significant difference" is due to the particular treatment. The proof is not absolute but unless otherwise stated the figure for significant difference is at the level of probability $P = 0{\cdot}05$, which means that the chances against drawing a wrong conclusion by using the significant difference figure is nineteen to one. If the significant difference is based on $P = 0{\cdot}01$ then the chances are ninety-nine to one against the conclusion being wrong.

Where no figure for significant difference is given the differences that occur cannot be considered as being due to the particular treatment.

COFFEE RESEARCH AND EXPERIMENTAL STATION, LYAMUNGU, MOSHI

Report for the period 1st January to 31st December 1946

ADMINISTRATION—STAFF LIST—AS AT 31ST DECEMBER 1946

S. M. Gilbert, B.Sc. (Agric.), N.D.A., Dip. Agric. (Wye), Chief Scientific Officer who has been in charge of the Station since its inception proceeded on leave pending retirement on September 30th 1946.

F. R. Sanders, B.A. (Hons.) (Cantab.), Dip. Agric. (Camb. Univ.), Senior Agricultural Officer assumed charge as from October 1st 1946.

J. K. Robertson, B.Sc. (Agric.) (Aberd.), A.I.C.T.A. continued as Agricultural Officer at the Station for the entire year.

A. W. Boot, Agricultural Assistant resigned as from October 26th 1946.

A. M. Pienaar, Agricultural Assistant was posted to the Station as from November 13th 1946.

FINANCE

Details of expenditure for the year 1946 are given in Appendix I. Revenue amounted to £2,905 18s. 6½d. of which £2,403 16s. 8½d. was from coffee.

VISITORS

His Excellency the Governor, Sir W. D. Battershill, K.C.M.G., Sir Harold Tempany Kt., C.M.G., C.B.E., Sir Frank Engledow; Professor Munro, Mr. Frank Debenham, Cambridge, I. J. Suckland, U.S.A. and many members of the Departments of Agriculture of neighbouring territories, have visited the Station during the year.

A Planters' Day was organized by the Tanganyika Coffee Growers' Association on October 17th 1946 which was attended by some thirty planters. Members of the Kilimanjaro Native Co-operative Union and several parties from the various schools in the district visited the Station during the year.

STATION DEVELOPMENT

A further three acres of coffee was planted, all with clonal material of coffee selections.

Statement of Acreages

		Acres		Change
Coffee:				
(a) under 4 years	15·70			
(b) 4 to 6 years	4·54	85·16	+	3·00
(c) over 6 years	64·92			
Nurseries and propagation beds		2·50		
Bananas and fodder grasses		48·00		
Paddocks		30·00		
Coppices and wind belts		35·00	+	2·00
In preparation for experiments		13·60	—	2·40
Forest		23·40		
Roads, buildings, etc.		28·00		
Bush—cleared and uncleared		38·44	—	2·00
Food crops for labourers		5·90	—	0·60
Total ...		310·00		

METEOROLOGY

The months of January, February and March were hot and dry (the highest temperature (96°F), so far recorded at the Station was recorded on January) this was followed by heavy rain in April and May. The rains of September and October 1946 were the heaviest so far recorded for these months.

The monthly rainfall for 1946 is given below:—

Monthly Rainfall from January 1946 to December 1946

	Inches
January	0·02
February	1·14
March	0·57
April	16·90
May	22·74
June	2·54
July	0·59
August	1·03
September	7·34
October	4·71
November	1·13
December	2·19
Total ...	60·90 inches.

Monthly rainfall from the period of September 1937 to August 1946 is given in Appendix II.

VEGETATIVE PROPAGATION

No horticulturist was available during 1946. Some additional frames were built and concrete tanks, previously used for growing coffee in sand culture, were adapted for use as frames. The total capacity of the frames is now 30,000 cuttings.

The losses after planting the rooted cuttings into baskets has been very much reduced by increasing the sand content of the potting medium.

PESTS AND DISEASES

During the hot dry months of January and March 1946 the incidence of Antestia was high. Routine sprayings with pyrethrum powder were carried out but complete control was not attained.

The incidence of Hemileia increased rapidly with the abnormally early rains of September 1946.

Leaf miner was again negligible.

MISCELLANEOUS

The Moshi Native Coffee Board continued to send pupils for training either as Instructors or as vegetative propagators.

ANIMAL HUSBANDRY

The average milk yield for the year for No. 1 herd was 2,414 lb. The highest yield in No. 1 herd in one lactation is 4,279 lb. for the 5th lactation.

The total yield for both herds amounted to 57,088 lb. Additional buildings are in the process of construction.

PADDOCKS AND FODDER GRASSES

Trials of the following grasses were made:—

(1) Chloris gayana; (2) Bromus marginatus; (3) Melanis minutiflora.

The cattle liked *Bromus marginatus* but the yield compared with Cynodon spp. is very poor.

Chloris gayana established itself readily and yielded well but the cattle preferred Cynodon spp.

Melinis minutiflora showed a very vigorous growth and although quite succulent was not eaten by the cattle, other grazing was preferred. If paddocked on this grass a taste for it might be acquired.

The fencing of paddocks was continued during the year.

LABOUR

Labour was sufficient to carry out routine work in connection with experiments and general maintenance work only. Projected building had to be postponed because the additional labour requirements were not available.

STATION EXPERIMENTS

After the record crop of the 1945 season the coffee yielded only $5\frac{3}{4}$ tons of parchment of which some 18 cwts. was sold as seed.

EXPERIMENT I.—*Method of Planting—Single Stem—Seedling Material, Planted 1935*

There was no crop on this experiment in the 1946 season : it is not surprising since in 1945 it bore at the rate of 26·41 cwt. of clean coffee per acre.

The summary of results for 9 years—1938-1946 is given below :—

Summary of Results 1938–1946

Yields in cwt.—clean per acre.

(a) MAIN PLOTS

	1938	1939	1940	1941	1942	1943	1944	1945	1946	Mean of 9 years 1938-1946
Treatments :										
No holing	6·66	2·11	5·08	11·94	5·04	17·11		24·86		8·43
*H3F1	7·90	1·13	6·85	11·67	4·98	17·42		27·73		9·05
†HF1	5·65	1·43	5·35	10·76	3·89	11·87		27·55		7·73
Hole sub-soiled :										
Without compost H3F1	7·78	1·17	6·51	12·30	3·81	14·77		26·14		8·33
Without compost HF1	6·11	1·53	5·46	11·43	3·70	13·24		25·19		7·81
With compost H3F1	8·29	0·82	5·83	11·72	4·85	14·54		27·07		8·59
With compost HF1	6·27	1·48	4·26	11·32	4·88	12·74		26·39		7·81
Mean	6·95	1·38	5·62	11·58	4·45	14·53		26·41		8·25
Standard error	0·30	–	0·08	0·41	0·19	0·65		0·38		0·16
Significant difference	0·85	–	·295	–	0·42	–		–		–
	(P = ·05)		(P = ·01)		(P = ·001)					

CROP FAILED

CROP FAILED

(b) SUB-PLOTS

Planting :										
Deep with ball of earth	6·22	1·26	4·97	11·20	3·76	14·36		25·83		7·82
Deep with bare roots	6·50	1·10	5·02	0·54	3·87	13·37		24·85		7·48
At nursery level :										
With ball of earth	7·85	1·68	6·35	12·03	5·80	15·10		26·81		8·86
Bare roots	7·24	1·49	5·32	12·56	4·36	15·29		28·14		8·81
Mean	6·95	1·38	5·62	11·58	4·45	14·53		26·41		8·25
Standard error	·117	–	·009	0·21	0·32	0·32		2·33		0·08
Significant difference	·331	–	0·32	1·82	0·62	0·91		–		0·10
P = ·05										

*H3F1 = Holed three months and filled one month before planting.
†HF1 = Holed and refilled one month before planting.

This experiment shows quite definitely that during the period of the experiment, ball planting or bare root planting at nursery level is a sound and profitable practice.

The experiment does not prove conclusively that either one of the treatments used for the main plots is better than any of the others but the higher yield of the plots holed three months and filled in one month before planting indicates that this treatment is likely to be the soundest. The results indicate also that no holing is better than holing one month before planting but that both are bad practices compared with holing three months before, and filling in one month before, planting.

EXPERIMENT II.—*Seedlings Selection Trials—Single Stem—Planted* 1938

The low yields in Latin Square IV are probably due to poorer soil conditions.

The results are given below:—

Latin Square I.—Planted May 1938

Summary of Results for 1941–1946. Yields in cwt.—clean per acre.

	1941	1942	1943	1944	1945	1946	Mean of 6 years 1941-1946
F 502	1·32 ...	2·65 ...	6·82 ...	8·42 ...	3·94 ...	5·02 ...	4·69
P 280	1·21 ...	4·35 ...	7·01 ...	7·87 ...	2·55 ...	4·85 ...	4·64
P 313	·95 ...	4·60 ...	6·17 ...	8·30 ...	2·57 ...	4·45 ...	4·51
P 348	·84 ...	2·07 ...	4·43 ...	6·38 ...	1·19 ...	5·31 ...	3·37
P 147	·73 ...	1·57 ...	3·82 ...	5·96 ...	1·54	4·20 ...	2·97
P 190	·77 ...	1·29 ...	1·53 ...	3·69 ...	0·87 ...	3·63 ...	1·96
Mean	·97 ...	2·76 ...	4·96 ...	6·77 ...	2·10 ...	4·58 ...	3·69
Standard error ...	– ...	·29 ...	·33 ...	0·42 ...	0·38 ...	0·51 ...	0·19
Significant difference	– ...	1·55 ...	·96 ...	1·24 ...	1·12 ...	– ...	0·55
		(P=·001)	(P=·05)	(P=·05)	(P=·05)		(P=·05)

Latin Square II.—Planted October 1938

Summary of Results for 1942–1946

	1941	1942	1943	1944	1945	1946	Mean of 5 years 1942-1946
H 133	– ...	1·56 ...	4·67 ...	4·57 ...	1·45 ...	3·18 ...	3·07
L 1	– ...	1·13 ...	4·86 ...	4·42 ...	2·05 ...	3·52 ...	3·20
F 839	– ...	1·11 ...	4·78 ...	5·39 ...	3·91 ...	2·38 ...	3·52
N 39	– ...	·93 ...	3·09 ...	3·35 ...	3·46 ...	3·04 ...	2·78
P 147	– ...	·76 ...	2·78 ...	4·28 ...	0·88 ...	3·29 ...	2·40
E 59	– ...	·69 ...	2·04 ...	3·94 ...	0·88 ...	3·20 ...	2·17
Mean...	– ...	1·03 ...	3·71 ...	4·29 ...	2·10 ...	3·10 ...	2·85
Standard error ...	– ...	0·27 ...	0·37 ...	0·24 ...	0·33 ...	0·44 ...	0·16
Significant difference P = ·05	– ...	– ...	1·08 ...	0·70 ...	0·99 ...	– ...	0·48

Latin Square III.—Planted October 1938

Summary of Results for 1942–1946. Yields in cwt.—clean per acre

	1942	1943	1944	1945	1946	Mean of 5 years 1942-1946
H I	1·34 ...	4·85 ...	8·36 ...	3·64 ...	1·82 ...	4·00
F 840	·90 ...	4·57 ...	7·87 ...	3·65 ...	3·44 ...	4·08
P 313	3·13 ...	4·30 ...	5·87 ...	0·75 ...	2·29 ...	3·27
N 69	1·83 ...	5·42 ...	5·06 ...	1·53 ...	3·37 ...	3·44
N 50	1·54 ...	4·77 ...	4·55 ...	1·08 ...	2·61 ...	2·91
E 665	1·40 ...	2·44 ...	4·24 ...	0·55 ...	2·78 ...	2·28
Mean	1·69 ...	4·39 ...	5·99 ...	1·87 ...	2·72 ...	3·33
Standard error	0·26 ...	·33 ...	0·44 ...	0·37 ...	0·45 ...	0·24
Significant difference	1·39 ...	·96 ...	1·30 ...	1·08 ...	– ...	0·70
	(P=·001)	(P=·05)	(P=·05)	(P=·05) ...		(P=·05)

Latin Square IV.—Planted 1939

Summary of Results for 1942–1946

	1942	1943	1944	1945	1946	Mean of 5 years 1942-1946
N 81	·94	1·56	2·78	0·01	1·28	1·32
N 39	·05	·61	1·81	0·09	0·62	0·64
L 1	·75	1·65	3·53	0·12	1·59	1·53
H 1	·81	3·28	6·23	2·16	0·88	2·67
N 197	·55	2·19	3·37	0·12	2·61	1·77
R 3	·98	2·16	2·39	0·04	1·34	1·38
Mean	·68	1·91	3·35	0·42	1·39	1·55
Standard error	0·08	·34	·25	–	0·26	0·21
Significant difference	·44	·33	·74	–	0·77	0·62
	(P=·001)	(P=·05)	(P=·05)		(P=·05)	(P=· 05)

EXPERIMENT IIIA.—*Seedlings versus Clones—Planted* 1942

The material used was taken from sixteen parent trees, all of which are in cluded in the selections for yield and is on single stem.

Summary of Results—Mean of 2 years, 1945–1946

	1945	1946	Summary of Results 1945-1946
	Clean cwt. per acre	Clean cwt. per acre	Clean cwt. per acre
Clones	3·17	–	1·58
Seedlings	2·06	–	1·03
Mean	2·62	–	1·30
Standard error... ...	0·23	–	0·12
Significant difference P=·05	0·75	–	0·37

Clones so far are superior to seedlings.

EXPERIMENT V.—*Mulch, Compost, Sulphate of Ammonia—Clonal material but not from trees selected for yield—Planted* 1940—*Single Stem*

There was no crop in 1946.

Throughout the experiment the application of Sulphate of Ammonia has had a depressing effect on yield and neither mulch nor compost have given significant results.

The quantities applied are:—

Mulch	M0 =	No mulch.
	M1 =	Elephant grass 40 lb. per tree.
	M2 =	Elephant grass 80 lb. per tree.
Compost ...	C0 =	Nil.
	C1 =	Compost, 1 debe per tree.
	C2 =	Compost, 2 [illegible] per tree.
		"
Sulphate of Ammonia	N0 =	Nil.
	N1 =	Single dose 3 oz. per tree.
	N2 =	Double doses 6 oz. per tree.

Summary of Results—Mean of 5 years, 1942–1946

	C0	C1	C2	Mean	Standard error
	Clean cwt. per acre	Clean cwt. per acre	Clean cwt. per acre	Clean cwt. per acre	Clean cwt. per acre
M0...	2·871	3·325	3·544	–	–
M1...	3·511	3·742	3·225	3·317	0·413
M2...	3·074	3·447	3·118	–	–

	N0	N1	N2	Mean	Standard error
	Clean cwt. per acre	Clean cwt. per acre	Clean cwt. per acre	Clean cwt. per acre	Clean cwt. per acre
M0...	3·627	3·214	2·900	–	–
M1...	3·724	3·367	3·387	3·317	0·413
M2...	3·396	3·165	3·079	–	–
C0...	3·281	3·251	2·924	–	–
C1...	3·738	3·424	3·353	3·317	0·413
C2...	3·727	3·071	3·090	–	–

Experiment VI.—*Manurial Experiment*

(comparing kind, quantity and dates of application of Nitrogen—Clonal material but nor from trees selected for yield)

This experiment is designed to determine the effects of three nitrogenous fertilizers: each fertilizer is used at three different rates per acre and is applied at three differing times in the year.

The fertilizers are:—

(1) Sulphate of Ammonia; (2) Nitrochalk and (3) Ammonium nitrate.

The fertilizers were applied for the first time in 1946, this being the first year they were available.

Experiment VIIa.—*Conversion to Multiple Stem—Converted* 1940

(Seedling material)

There was very little crop in 1946. The summary of the results for the years 1940-1946 is given below:—

Summary of Results 1940–1946

Yields in cwt.—clean per acre

	1940	1941	1942	1943	1944	1945	1946	Mean of 7 years 1940-1946
Clean stumped, 3 suckers	0·7	10·2	10·4	10·86		12·05		6·45
West side primaries cut off, 3 suckers from bottom	2·9	8·1	16·0	11·88		12·90		7·80
East side primaries cut off, 3 suckers from bottom	3·8	9·7	14·9	12·22		12·56		7·64
All except top three pairs of primaries cut off, 3 suckers from bottom	3·8	10·5	13·6	12·90	FAILED	13·92	FAILED	7·98
Agobiada, multiple stem, 3 suckers	1·2	11·4	10·0	11·20		12·90		6·96
Top cut at 3 feet from ground and 3 suckers left to grow at top	2·1	7·8	14·8	9·67	CROP	9·50	CROP	6·45
Mean	2·2	9·7	13·2	11·54		12·30		7·30
Standard error	–	·5363	0·58	0·68		0·71		0·29
Significant difference	0·76 (P=·01)	1·97 (P=·01)	2·68 (P=·001)	1·88 (P=·05)		1·97 (P=·05)		0·80 (P=·05)

The position remains the same, namely that the best of the above methods for converting to multiple stem are:—

(1) Cutting off either the East or West side primaries and allowing three suckers to come up from the bottom of the main stem or

(2) Cutting off all primaries except the top three pairs and allowing three suckers to come up from the bottom of the main stem.

EXPERIMENT IX.—*Methods of Cultivation—(Seedling material)—Planted* 1934

There was no crop in this experiment in 1946.

The results obtained together with the summary of 9 years 1938-1946 are given below:—

Summary of Results 1938–1946

Yield in cwt.—clean per acre

Treatment	1938	1939	1940	1941	1942	1943	1944	1945	1946	Mean of 9 years 1938-1946
A. Forked hoe (forked jembe)	5·77	0·27	2·60	9·23	1·86	7·86		6·28		3·77
B. West Indian hoe (jembe)	5·79	0·48	2·74	8·23	2·43	7·73		6·60		3·78
C. No cultivation	5·61	0·41	2·20	9·16	1·90	7·17		5·79		3·58
D. Envelope forked	4·55	0·35	1·67	7·32	1·63	5·26		5·29		2·90
E. Trenching	4·81	0·45	2·11	9·33	1·38	5·80		5·24		3·24
Mean	5·31	0·39	2·26	8·66	1·84	6·76		5·84		3·46
Standard error	–	–	0·34	0·33	0·10	0·12		0·62		0·27
Significant diff. P=·05	–	–	1·05	–	–	–		–		–

CROP FAILED

There is no significant difference between any of the treatments.

EXPERIMENT X.—*Artificial Shade—Planted* 1937—*Clonal material but not from trees selected for yield*

The experiment is in abeyance pending the arrival of materials.

EXPERIMENT XIV.—*Mulch Experiment—Seedling Material—Planted* 1935

Single stem converted to multiple stem January, 1945. There was only a small crop in 1946. The summary of results for the year together with the summary of results for the period 1938-1946 is given below:—

Summary of Results 1938–1946

Yields in cwt.—clean per acre

Treatment (per tree)	1938	1939	1940	1941	1942	1943	1944	1945	1946	Mean of 9 years 1938-1946
Banana mulch (80 lb.)	6·79	0·65	8·57	9·74	12·42	8·26	1·60	1·88	0·57	5·61
Guinea grass mulch (80 lb.)	4·19	1·24	8·42	8·73	13·97	8·03	2·11	2·05	1·22	5·52
Banana mulch (40 lb.) plus sulphate of ammonia (½ lb.)	2·25	0·94	6·69	9·43	9·41	9·29	0·35	1·06	0·23	4·40
Elephant grass mulch (80 lb.)	1·75	0·38	5·67	9·31	9·09	6·27	0·79	1·46	0·51	3·89
Clean weeded	2·52	0·35	7·48	4·81	15·03	4·41	3·20	1·82	0·30	4·44
Weeds as mulch	2·82	0·45	7·19	4·67	11·64	3·73	1·26	1·95	0·38	3·79
Elephant grass mulch (40 lb.) plus sulphate of ammonia (½ lb.)	1·97	0·40	7·19	6·75	13·22	4·80	1·91	1·71	0·54	4·27

Clean weeded plus compost (2 debes)...	2·74...	0·50 ...	8·04 ...	5·61 ...	16·60 ...	4·04 ...	3·24...	2·60 ...	0·35 ...	4·88
Mean ...	3·14...	0·61 ...	7·41 ...	7·31 ...	12·67 ...	6·10 ...	1·81...	1·82 ...	0·51 ...	4·60
Standard error ...	–...	– ...	0·10 ...	0·86 ...	1·2 ...	1·12 ...	0·43...	0·27 ...	0·25 ...	0·23
Significant difference	–...	– ...	0·29 (P=·05) ...	3·32 (P=·001) ...	3·3 (P=·05) ...	3·20 (P=·05) ...	1·25... P=·05)	0·78 ... (P=·05)	– ...	0.67 (P=·05)

EXPERIMENT XIVA.—*Mulch Experiment—combining the application of mulches with Sulphate of Ammonia—Planted* 1940*—Clonal material but not from trees selected for yields*

The crop was negligible except in the Banana trash and Guinea grass sub-plots. In all cases the application of Sulphate of Ammonia depressed yields. The crop from the banana trash and guinea grass sub-plots are significantly higher than the yields from the corresponding sub-plots to which sulphate of ammonia was applied.

Summary of Results—1946 Crop

Treatment:	Main Plots Clean cwt. per acre	Sub-Plots *Without Nitrogen Clean cwt. per acre	*With Nitrogen 4 oz. per tree. Clean cwt. per acre
A. Nil	0·144	0·230	0·059
B. Banana mulch (80 lb. per tree)	0·633	0·902	0·363
C. Elephant grass (80 lb. per tree)	0·158	0·186	0·130
D. Guinea grass (80 lb. per tree)	0·590	0·827	0·353
E. Compost (50 lb. per tree)	0·033	0·038	0·028
Mean	0·312	0·437	0·186
Standard error	0·081	0·066	0·070
Significant difference	0·246	0·195	0·207

Summary of Results—Mean of 5 years, 1942–1946

A. Nil	3·402	3·186	3·617
B. Banana mulch (80 lb. per tree)	3·766	3·844	3·689
C. Elephant grass (80 lb. per tree)	3·709	3·844	3·574
D. Guinea grass (80 lb. per tree)	3·597	3·655	3·539
E. Compost (50 lb. per tree)	3·342	3·475	3·210
Mean	3·563	3·601	3·526
Standard error	0·211	0·085	0·085

*Sulphate of Ammonia application 1941 2 oz. per tree. 1944 4 oz. per tree.
1942 2 oz. per tree. 1945 4 oz. per tree.
1943 4oz. per tree. 1946 8 oz. per tree.

These were applied towards the end of the long rains in each case, i.e. mid-May.

In only one season so far, 1945, one of heavy rain, has the application of Sulphate of Ammonia been beneficial. In the 1945 season significantly higher yields were obtained when it was used on the Control and in combination with guinea grass. Increases were indicated when it was used in conjunction with banana trash and compost, but when used in conjunction with elephant grass the yield was depressed.

The Soil Chemist's analysis of the nitrate content, etc. in February 1946 in this Experiment is given below:—

"All sub-plots were sampled at the end of February 1946, i.e. after six years of treatments, for the determination of nitrate in the surface soil—indicating the nitrate accumulated prior to the 1946 rainy season—at a time when this is at a maximum: also to see whether treatments had built up reserves of organic matter.

In 1945, compost was applied on 27th of March. By May 15th, when the sulphate of ammonia was applied, 25 inches of rain had fallen. After this 14·5

inches fell during the remainder of the rainy season during which all the sulphate of ammonia would have been nitrified. The mulches were applied on June 25th.

The short rains in November amounted to 4·7 inches.

1. *Nitrate content of surface soil in February* 1946.

	Parts per million No. N.		
Main Plots:			
A	11·4	±	2·02
B	49·4	±	2·02
C	27·6	±	2·02
D	43·6	±	2·02
E	21·4	±	2·02

Significant Difference for P = ·05 is 6·23.

Thus, available nitrogen under banana trash and guinea grass is very much higher than under the other treatments. Elephant grass mulch is superior to compost in this respect, and both are superior to the control plots.

Influence of sulphate of ammonia.

	Without Nitrogen	With Nitrogen
Half Plots Means:		
A	10·6 ...	12·2
B	46·0 ...	52·8
C	26·0 ...	29·2
D	49·8 ...	37·4
E	20·0 ...	22·8

The greater value for the Nitrogen plots in B is not significant at P = ·05, neither are the differences in A, C and E.

The lower value for the Nitrogen plots in D is significant. In effect we can say that whereas the sulphate of ammonia increased the nitrate status when it was needed and before the mulch was applied, there was subsequently some interaction between the mulch and soil nitrate or else root growth was more vigorous and removed more from the surface soil in the nitrogen plots.

2. *The effect of treatments on organic matter.*

Content of the Soil

		Organic Carbon Per cent
Whole Plots Means:		
A	4·65	± ·24
B	5·46	± ·24
C	4·71	± ·24
D	4·80	± ·24
E	4·73	± ·24

Significant Difference at P = ·05 is ·066 per cent.

The Banana trash alone has brought about an increase in organic matter.

Influence of sulphate of ammonia.

	Without Nitrogen	With Nitrogen
Half Plots Means:		
A	4·65 ...	4·65
B	5·35 ...	5·57
C	4·76 ...	4·66
D	4·92 ...	4·67
E	4·83 ...	4·62

Differences between half plots with and without nitrogen are not significant".

Why the application of Sulphate of Ammonia has depressed the yields in all seasons except 1945 is not understood.

EXPERIMENT XV.—*Irrigation and Mulching—Planted* 1940—*Clonal material but not from parents selected for yield—No Shade*

Treatments:
0 = no treatment.
1 = rainfall made up to 2 inches monthly.
2 = rainfall made up to 4 inches monthly.
3 = rainfall made up to 2 inches fortnightly.

Mulch:
0 = no treatment.
1 = banana trash 40 lb. per tree applied in June.
2 = banana trash 80 lb. per tree applied in June.
3 = banana trash 40 lb. per tree applied in June.
40lb. per tree applied in December.

The summary of results—mean of 5 years (1942-1946) are given in the tables I to VI below and are expressed in clean cwt. per acre.

TABLE I

Mean yield for Irrigation

Irrigation	Clean cwt. per acre
0	1·975
1	3·393
2	3·391
3	3·039
Mean	2·949
Standard error	0·113
Significant difference, P = ·05	0·334

Treatments 1, 2 and 3 have given significantly better yields than 0, treatments 1 and 2 have equal effects and treatment 3 depresses the yield as compared with 1 and 2.

TABLE II

Mean yields for mulching

Mulch	Clean cwt. per acre
0	2·279
1	3·290
2	3·167
3	3·061
Mean	2·949
Standard error	0·113
Significant difference, P = ·05	0·334

Treatments 1, 2 and 3 have given significantly better yields than 0, treatments 2 and 3 depresses the yield as compared with 1.

TABLE III

Mean yields of Clones

Clone	Clean cwt. per acre
KIL 50	2·615
KIL 98	3·069
KIL 48	2·891
KIL 10	3·224
Mean	2·949
Standard error	0·113
Significant difference, P= ·05	0·334

KIL 10 yields at a significantly higher rate than either KIL 50 or KIL 48, this is due to genetic differences.

TABLE IV

Adjusted Mean Yields for Interactions of Irrigation and Mulching

Mulch	Irrigation 0	1	2	3	Mean
	cwt.	cwt.	cwt.	cwt.	cwt.
0	0·971	2·625	3·113	2·409	2·279
1	2·414	3·652	3·854	3·240	3·290
2	2·247	3·593	3·331	3·495	3·167
3	2·267	3·701	3·265	3·012	3·061
Mean	1·975	3·393	3·391	3·039	2·949

Standard error of Entries in the body of table is 0·226 cwt. per acre.

The differences arising from the various combinations of irrigation and mulch are not statistically significant so far.

The response to irrigation in the absence of mulch is greater than when mulch is given and the effect of irrigation 2 is more marked in the absence of mulch.

Similarly in the absence of irrigation the response to mulch is greater than on the irrigation plots.

TABLE V

Adjusted Mean Yields for Interactions of Irrigation and Clone

Clone	Irrigation 0	1	2	3	Mean
	cwt.	cwt.	cwt.	cwt.	cwt.
KIL 50	1·540	3·431	2·869	2·619	2·615
KIL 98	1·964	3·268	3·569	3·474	3·069
KIL 48	2·265	3·183	3·056	3·061	2·891
KIL 10	2·131	3·691	4·070	3·002	3·223
Mean	1·975	3·393	3·391	3·039	2·949

Standard error of Entries in the body of table is 0·226 cwt. per acre.

The differences in the response of the clones to the various irrigation treatments are not significant.

TABLE VI

Adjusted Mean Yields for Interactions of Mulching and Clone

Clone	Mulch 0	1	2	3	Mean
	cwt.	cwt.	cwt.	cwt.	cwt.
KIL 50	1·877	3·059	2·487	3·036	2·615
KIL 98	2·562	3·244	3·221	3·246	3·069
KIL 48	2·011	3·362	3·219	2·973	2·891
KIL 10	2·667	3·495	3·740	2·992	3·223
Mean	2·279	3·290	3·167	3·061	2·949

Standard error of Entries in the body of table is 0·226 cwt. per acre.

The differences in the response of the clones to the various mulch treatments are not significant.

EXPERIMENT XIIIA, B AND C.—*Multiple Stem versus Single Stem—Seedlings—Planted 1936*

In the case of the multiple stem coffee the 1946 season was the second season in the second cycle.

Treatments:	Summary of Results for 1946 Clean cwt. per acre
Single stem	1·04
Multiple stem, 3 suckers	2·30
Agobiada, multiple stem, 3 suckers	0·90
Mean	1·41
Standard error	0·312
Significant difference, P = ·05	1·256

Summary of Results—Mean of 9 years, 1938-1946

	Clean cwt. per acre
Single stem	4·208
Multiple stem (3 suckers)	7·976
Multiple stem (3 suckers) (Agobiada)	5·834
Mean	6·092
Standard error	0·288
Significant difference, P = ·05	1·085

The recommended system of Multiple Stem has continued to maintain its great superiority (80 per cent more crop than the single stem), in the second year of bearing in the second cycle its yield was considerably more than that of the single stem which is now 10 years old.

EXPERIMENT XII.—*Selection in Nursery—Planted* 1935—*Seedling material*

The annual yields together with the summary of results for 9 years are given below:

Summary of Results 1938–1946

Yield in cwt.—clean per acre

Plots:	1938	1939	1940	1941	1942	1943	1944	1945	1946	Mean of 9 years 1938-1946
Tops cut back	2·84	0·81	4·62	5·83	3·45	5·86	5·19	4·99	4·20	4·20
Good tops and good roots	5·77	0·75	4·40	8·67	2·96	9·26	4·48	5·74	5·11	5·24
Average	4·07	0·57	4·55	7·23	2·94	6·55	4·48	6·29	5·67	4·71
Good tops and poor roots	4·62	0·62	5·37	7·00	3·22	6·01	5·01	4·65	4·92	4·60
Poor tops and good roots	3·66	0·57	4·84	6·07	2·45	6·39	4·71	5·56	5·02	4·36
Poor tops and poor roots	2·89	0·69	4·51	6·59	2·39	5·09	5·22	6·49	4·16	4·23
Mean	3·98	0·67	4·72	6·90	2·90	6·53	4·85	5·62	4·85	4·56
Standard error	–	–	0·413	0·87	0·55	0·75	0·44	1·02	1·24	0·34
Significant difference	–	–	–	–	–	–	–	–	–	–

No significant results have been obtained over the period but it is indicated that selection in the nursery of plants with good tops and good roots is sound practice.

EXPERIMENT XVIII.—*Clonal Selection Trials—Planted* 1943

Two additional squares were planted in 1946 and will be grown on the Multiple Stem system.

No conclusion can yet be drawn from the results so far obtained from the areas planted in 1943.

The annual yields and the summary of results for the years 1945 and 1946 are given below:—

Latin Square I.—Planted 1943

Yields in clean cwt.—per acre

	1945 Clean cwt. per acre	1946 Clean cwt. per acre	Summary of Results 1945-1946 Clean cwt. per acre
N 39	4·84	1·30	3·07
R 23	1·29	1·44	1·36
N 71	1·37	2·18	1·78
I 60	2·04	3·52	2·79
M 2	1·90	3·37	2·64
L 1	2·33	2·04	2·19
Mean	2·29	2·31	2·31
Standard error	0·26	0·45	0·25
Significant difference, P = ·05	0·76	1·32	0·74

Latin Square II.—Planted 1943

N 48	2·06	2·45	2·26
N 197	4·17	5·33	4·75
N 5	5·29	0·93	3·11
N 29	3·03	2·43	2·73
N 30	2·98	0·95	1·98
N 20	1·44	2·22	1·84
Mean	3·17	2·39	2·79
Standard error	0·33	0·46	0·29
Significant difference, P = ·05	1·39	1·35	0·86

Latin Square VII.—Planted 1943

Yields in clean cwt.—per acre

	1945 Clean cwt. per acre	1946 Clean cwt. per acre	Summary of Results 1945-1946 Clean cwt. per acre
R 15	3·63	2·50	3·07
N 81	3·76	3·65	3·70
KP 228	2·80	2·80	2·80
I 49	2·14	1·43	1·78
S 16	2·32	0·95	1·64
N 34	1·68	1·90	1·80
Mean	2·73	2·21	2·46
Standard error	0·44	0·38	0·34
Significant difference, P = ·05	1·30	1·12	1·00

Latin Square VIII.—Planted 1943

R 2	2·38	4·55	3·47
H 66	2·58	3·47	3·03
M 7	1·46	3·48	2·48
AB 92	0·95	3·20	2·08
N 218	2·23	2·25	2·25
N 100	2·22	4·65	3·44
Mean	1·97	3·59	2·79
Standard error	0·35	0·47	0·32
Significant difference, P = ·05	1·02	1·38	0·94

EXPERIMENT IV.—*Clonal Selection Trials*

Latin Square V.—Planted 1942

Latin Square II.—Planted 1943

Yields in clean cwt.—per acre

Latin Square V	1945	1946	Summary of Results 1945-1946
N 39	2·47	–	1·24
R 3	4·37	–	2·18
L 1	3·86	–	1·92
N 100	2·97	–	1·48
N 197	4·23	–	2·12
Mean	3·58		1·79
Standard error	0·33	–	0·17
Significant difference, P = ·05	1·02	–	0·52
Latin Square II			
N 39	1·11	–	0·56
R 3	1·31	–	0·65
L 1	1·40	–	0·71
N 100	1·19	–	0·59
N 197	1·64	–	0·81
Mean	1·33	–	0·67
Standard error	0·15	–	0·07
Significant difference P = ·05	0·45	–	–

These clones are growing under less favourable soil conditions than those in Experiment XVIII and are under moderately heavy shade.

Lyamungu,
July 1947.

F. R. SANDERS,
Acting Chief Scientific Officer

STATEMENT OF EXPENDITURE FOR THE PERIOD 1st JANUARY TO 31st DECEMBER, 1946

I.—Personal Emoluments

Item No.		Provision Shs.	Cts.		Expenditure Shs.	Cts.
3.	Chief Scientific Officer	24,000	00	...	24,000	00
28.	Clerks (L.C.S.)	7,007	00	...	6,194	77
30.	Recorders (L.C.S.)	7,520	00	...	7,350	11
32.	Mechanics (L.C.S.)	5,530	00	...	4,819	00
33.	Instructors (Ungraded)	1,150	00	...	925	00
36.	Laboratory Assistants	1,010	00	...	980	19
37.	Overseers, Agricultural Station	1,010	00	...	934	68
39.	Motor Drivers	720	00	...	720	00
40.	Messengers	550	00	...	492	64
		48,497	00	...	46,416	39
	Outstanding accounts on Mechanic's salary—2 months	–		...	680	00
		48,497	00	...	47,096	39

II.—Other Charges

42.	Transport and Travelling	9,080	00	...	8,714	85
43.	Maintenance and Running of Motor Vehicles	4,600	00	...	4,592	82
44.	Bicycles	100	00	...	25	96
45.	Books of Reference	400	00	...	390	08
46.	Contingencies	240	00	...	155	66
48.	Office and General	400	00	...	341	17
51.	Uniforms	360	00	...	359	21
62.	Upkeep of Agricultural Station:					
	(a) Mbosi plot	2,000	00	...	1,558	72
	(b) Lyamungu	3,500	00	...	2,780	85
64.	Upkeep of Coffee Research Station:					
	(a) Labour				40,247	43
	(b) Field Experiment off Station				758	75
	(c) Maintenance of Power, light and gas				3,105	59
	(d) Maintenance of Water Supply				497	18
	(e) Upkeep of Coffee Factory	65,100	00	...	3,618	39
	(f) Upkeep of Stock				3,973	84
	(g) Equipment and Materials, etc.				8,533	95
	(h) Trials of Clonal Coffee Selections				2,499	60
	(i) Miscellaneous				592	96
		85,780	00	...	82,747	01
	Outstanding accounts on Crown Agents' Indents and Railways	—		...	1,000	00
		85,780	00	...	83,747	01
45.	Agriculture Development— 23 Cowshed	15,000	00	...	14,613	35
25.	Miscellaneous Services— 27 Postage			...	72	70
25.	Miscellaneous Services— 39 Transport and Allowance on leave			...	602	91
37.	Subsidization— 2 Cost of Living Relief			...	7,854	91

MONTHLY RAINFALL FROM SEPTEMBER 1937 TO END OF AUGUST, 1946

(in inches)

	Sept. 1937 to end of Aug. 1948	Sept. 1938 to end of Aug. 1939	Sept. 1939 to end of Aug. 1940	Sept. 1940 to end of Aug. 1941	Sept. 1941 to end of Aug. 1942	Sept. 1942 to end of Aug. 1943	Sept. 1943 to end of Aug. 1944	Sept. 1944 to end of Aug. 1945	Sept. 1945 to end of Aug. 1946
September	1·03	0·17	1·61	0·33	2·76	0·11	0·49	2·42	0·20
October	4·35	2·16	0·08	1·03	0·09	0·42	0·17	3·15	0·05
November	3·91	2·57	0·57	0·90	4·47	3·60	2·00	3·10	4·66
December	1·64	1·02	0·32	1·07	9·72	1·75	0·32	5·14	0·30
January	0·52	0·22	2·83	1·23	1·59	0·07	1·02	1·72	0·02
February	2·43	0·41	5·27	1·91	0·38	2·61	1·69	1·39	1·14
March	12·42	4·57	4·12	2·38	15·02	1·32	5·82	4·85	0·57
April	10·79	26·18	21·63	15·92	37·07	7·95	30·04	15·19	16·90
May	19·44	25·31	12·04	10·24	19·43	19·46	11·97	21·34	22·74
June	2·61	8·74	2·68	5·09	4·54	4·06	4·65	3·45	2·54
July	1·92	0·77	2·04	0·76	2·38	4·42	2·21	3·15	0·59
August	0·67	0·54	2·58	2·10	1·22	0·37	1·43	1·33	1·03
Total (in inches)	61·73	72·66	55·77	42·96	98·67	46·14	61·81	66·23	50·74